Fig. 7 depicts the assembly of a processing bag by joining two weld rings to a processing bag and central hub.

Fig. 8 depicts a perspective view of the joining of one weld ring to a processing bag and central hub.

Fig. 9 depicts a bag set assembly with six alternating expressor and processing bags 92, a fluid entry hub 91 and a fluid supply tube 93.

Fig. 10 depicts a side view of a bag set of an assembly of a processor bag within an expressor bag embodiment.

Fig. 11 depicts a cross-sectional side view of an assembly of a processor bag within an expressor bag embodiment.

Fig. 12 depicts an exploded perspective view of the assembly of a processor bag within an expressor bag embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention provides multiple processing chamber sets for processing simultaneously and independently a number of separate samples at one time in a centrifugal cell processing device. The multiple processing chamber sets permit sterile addition and removal of samples (and processed fractions thereof), processing fluids (including enzymes, salts, buffers and other process chemicals), and waste products without the need for rotating seals of any kind. Thus, the multiple processing chamber set represents a portion of a closed system for biological cell processing and includes a number of separate closed containers that can be treated in series or in parallel.

In one embodiment of the present invention, the multiple processing chamber set includes sequentially alternating processing and expressor flexible chambers (also referred to herein as "bags") such that each processing bag is in contact with one or more expressor bags. In one embodiment, the expressor (E) and processing (P) bags are provided in a 1:1 ratio and are alternated in the sequence:

E-P-E-P-E-P-E-P-E.

In another embodiment, the expressor and processing bags are provided in a 2:1 ratio, sequenced to surround each processing bag P with its own set of two expressor bags:

E-P-E-E-P-E-E-P-E-E-P-E.

In each of the foregoing examples, four processing bags P may be provided. The multiple processing chamber sets of the invention can theoretically have any specific number of bags, from two to infinity, to process a like number of samples. Thus, for the application of the multiple processing chamber sets of the invention to blood processing, for example, the number of bags will usually correspond to the number of units or blood to be processed. In such cases, a multiple processing chamber set can be selected that has the appropriate number of processing bags. Alternatively, one or more of the processing bags can optionally be left unfilled or filled with a solution that is not processed if the multiple processing clamber set used contains a greater number of processing bags than the number of samples to be processed.

The optimal number and configuration of bags in the multiple processing chamber set may be constrained by the size and capacity of the centrifugal device, the materials used, or other factors known to one of ordinary skill in the art. Preferably, the multiple processing chamber sets of the invention have between 4 and 16 processing bags, and more preferably have between 8 and 12 processing bags, with appropriate numbers of expressing bags interspersed as described above.

The processing and expressor bags may be placed in the above mentioned alternating sequence with an orientation that places all bags or chambers along a centrally located axis of rotation. Thus the chambers are all axially aligned, i.e., stacked (see Fig. 9, item 92). This axis is defined on each bag by noting the largest bag surface area and finding the center of rotation perpendicular to the largest bag or chamber surface. Preferably the bags are circular in shape, although other shapes may be used.

Each processing or expressor bag is comprised of a flexible compartment, a central

hub and weld rings for connecting the flexible compartment to the central hub. As shown in Figs. 1 and 5 for expressor bags and processing bags, respectively, the bags 10, 50 have an axial aperture 11, 51 where the central hub is joined. The flexible compartment of the processing bag and central hub are constructed of a plastic material that is able to withstand a variety of processing conditions including, but not limited to, changes in temperature, pH, and salt concentrations; application of acceleration, deceleration and centrifugal forces; and application of force from inflation or expansion of the expressor bags. The flexible compartment of the expressor bag is constructed of a plastic material that is able to withstand inflation with expressor fluid or gas. Preferably the flexible compartments of the processing and expressor bags are constructed using a PVC material. Preferably the central hubs and weld rings are constructed using a rigid plastic material.

The central plastic hubs for the processing and expressing chambers are notably different and interlock such that, for proper assembly of multiple processing chamber sets, the alternating sequence of processing and expressing bags in a 1:1 ratio must be maintained. Compare the shapes of the expressor bag central hub depicted in Fig. 2 and the processing bag central hub depicted in Fig. 6. Each of these respective central hubs has a different male-female connection to prevent connection with a like hub. For example, the outer ring 61 that surrounds the male connector 64 of the processing hub will prevent mating with another processing central hub, but fits the outer flange 21 to permit mating with one side of the expressor central hub (middle view). When appropriately mated, matching features of the processing and expressor central hubs will align, e.g., peripheral holes 22, 62, and central holes 23, 63 in all cases; as well as one of the following sets of surfaces: surfaces 24, 64 and 25, 65 or surfaces 26, 66 and 27, 67. Other features of the central hubs provide for proper rotational orientation of the expressor and processing hubs relative to each other to prevent misalignment of peripheral holes 22, 62.

For assembly of multiple processing chamber sets having expressor and processing bags in a 2:1 ratio, a different geometry may be provided for the central plastic hubs that connect the two expressor bags inserted between two processing bags (i.e., the connection underlined: P-E-E-P).